

Missouri Department of Natural Resources

## Total Maximum Daily Load Information Sheet

### Grindstone and Hinkson Creeks

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#### Water Body Segments at a Glance:

**County:** Boone  
**Nearby Cities:** Columbia  
**Length of impaired segment:**  
    **Hinkson:** 18 miles  
    **Grindstone:** 1.5 miles  
**Pollutant:** Bacteria  
**Source:** Unknown  
**Water Body IDs:** Hinkson Creek - 1008  
                      Grindstone Creek - 1009



State Map Showing Location of Watershed

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**Scheduled for TMDL development: 2010**

#### Description of the Problem

##### Beneficial uses of Grindstone and Hinkson creeks

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health (Fish Consumption)
- Whole Body Contact Recreation

##### Use that is impaired

- Whole Body Contact Recreation (Grindstone – Category A; Hinkson – Category B)

##### Standards that apply

- Missouri's Water Quality Standards at 10 CSR 20-7.031(4)(C) state that the *E. coli* bacteria count shall not exceed 126 colonies per 100 milliliters of water (126 col/100 mL) for Category A and 206 col/100 mL for Category B waters. This count is the geometric mean during the recreational season (April 1- October 31) in waters designated for whole body contact recreation.

##### Background information and water quality data

Grindstone Creek flows west to join Hinkson Creek just south of Columbia in Boone County, Missouri. A separate TMDL has been developed for Hinkson Creek for unknown pollutants. Since Grindstone Creek is a tributary to Hinkson, and both are impaired by bacteria, they will be dealt with in the same document. For whole body contact recreation waters, Category A means there are swimming areas which are open to and fully accessible by the public. Category B waters have

places deep enough for total immersion (i.e., swimming), but they may be on private lands or inaccessible to the public.

The evidence for the bacteria impairment comes from data gathered by the department in 2004 and 2005 (See data in table and graphs below). The listing methodology states that, to be considered not impaired, a water body must meet the water quality criterion in each of the last three years of available data and that the geometric mean must consist of at least five data points within the recreational season. The geometric mean of the recreational season samples from both creeks exceeded the criterion for their respective categories in 2004. The exact source(s) of the impairment is unknown, but the usual suspects are leaking septic systems, both municipal and on-site (individual), runoff from manure used as fertilizer and manure from pets, livestock and wild animals.

Excessive amounts of fecal bacteria in surface water used for recreation are an indication of an increased risk of pathogen-induced illness to humans. Infections due to pathogen-contaminated waters include gastrointestinal, respiratory, eye, ear, nose, throat and skin diseases. *E. coli*, are bacteria found in the intestines of warm blooded animals and are used as indicators of the risk of waterborne disease from pathogenic (disease causing) bacteria or viruses. Most *E. coli* strains are harmless, but some can cause serious illness in humans and are occasionally responsible for product recalls. The harmless strains are part of the normal flora of the intestines, and can benefit their hosts by preventing the establishment of pathogenic bacteria within the intestine<sup>1,2</sup>. Missouri's bacteria criteria are based on specific levels of risk of acute gastrointestinal illness. The levels of risk correlating to these criteria are no more than eight illnesses per 1,000 swimmers in fresh water.

People can protect themselves from waterborne illness by avoiding contact with contaminated water. However, when swimming anywhere, it is wise to take common sense precautions. These include washing hands before eating, showering after swimming and avoiding exposure to questionable water if you have open cuts or wounds.

#### ***E. coli* Data Collected During the 2004 and 2005 Recreational Seasons**

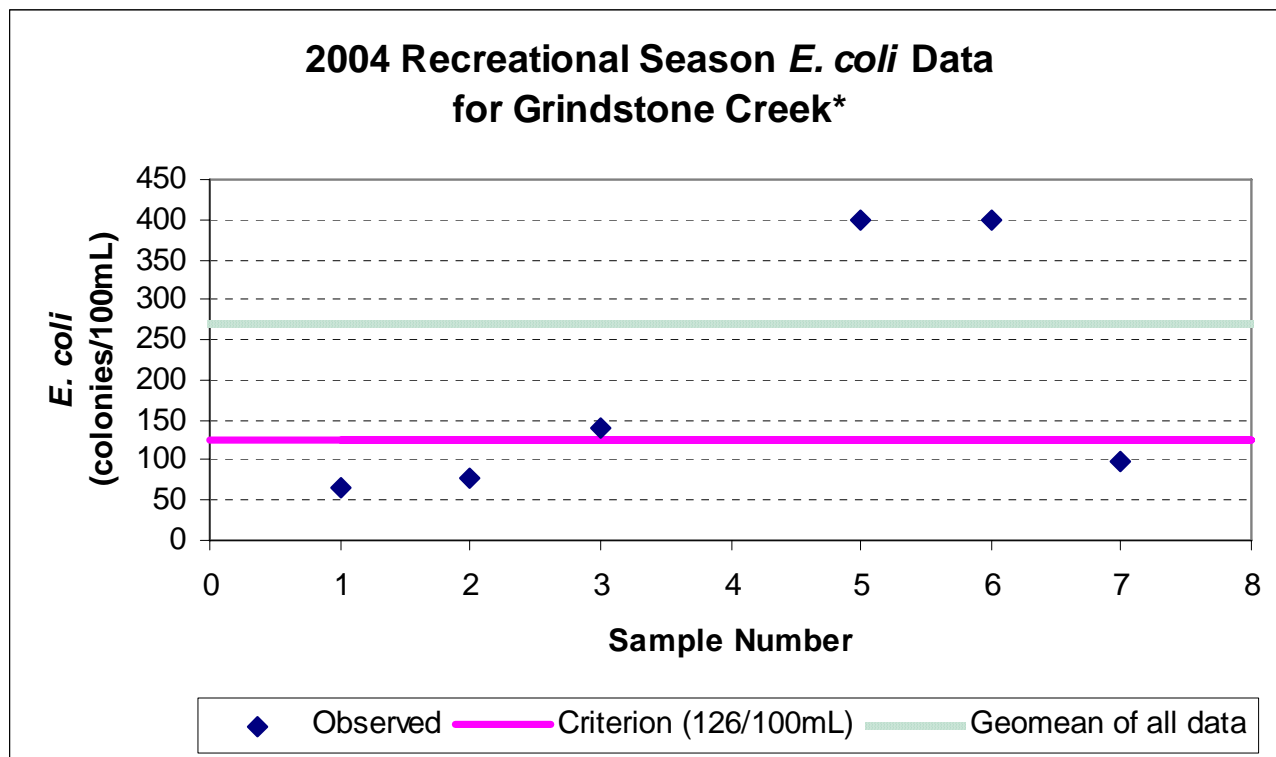
<b>Water Body</b>	<b>Recreational Season*</b>	<b>Total # of Samples</b>	<b>Max</b>	<b>Min</b>	<b>Geometric Mean</b>
Hinkson	2004	67	9676*	6	233
Hinkson	2005	19	1730	6	90
Grindstone	2004	7	9676	66	272

\*Notes: Recreational season in Missouri is April 1 – Oct. 31.

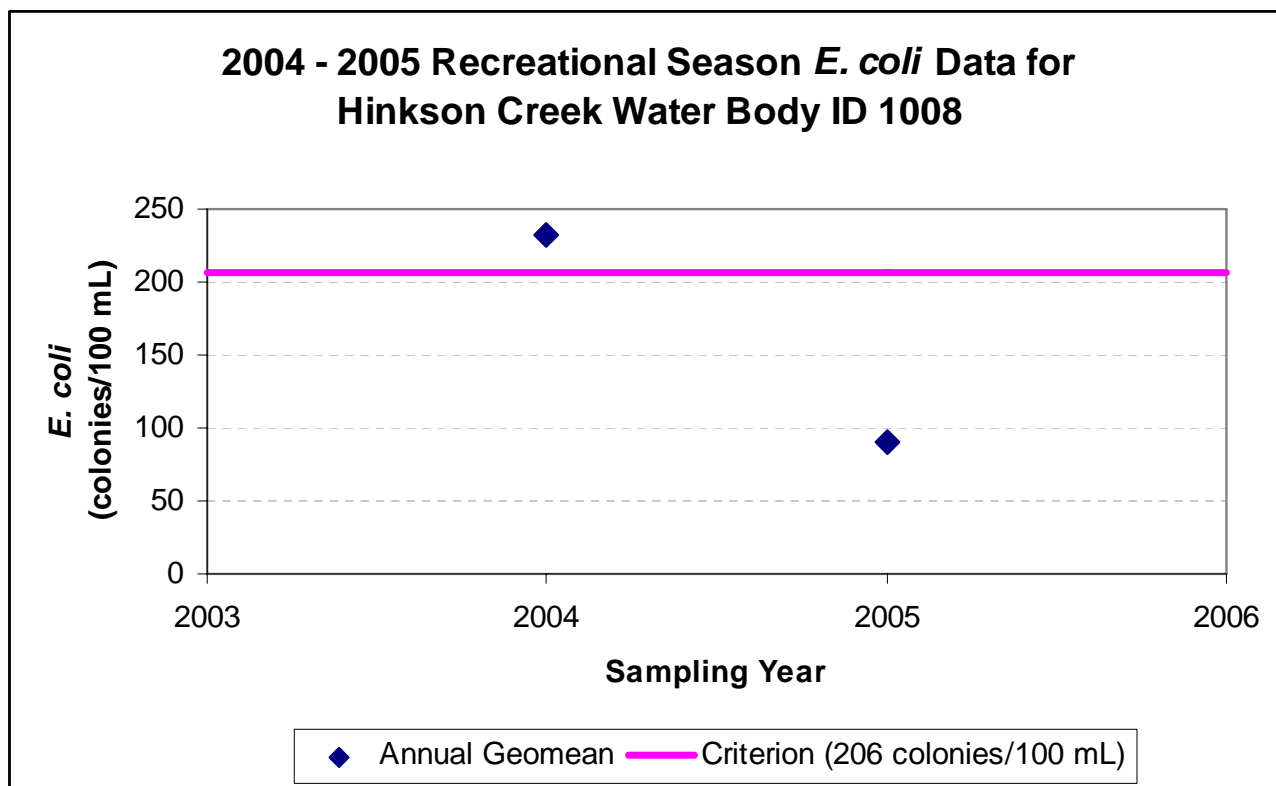
9676 = an "upper" detection limit. This number means there were this many or more *E. coli* col/100 mL

<sup>1</sup> Hudault S, Guignot J, Servin AL (July 2001). "[Escherichia coli strains colonising the gastrointestinal tract protect germfree mice against Salmonella typhimurium infection](#)". *Gut* **49** (1): 47–55

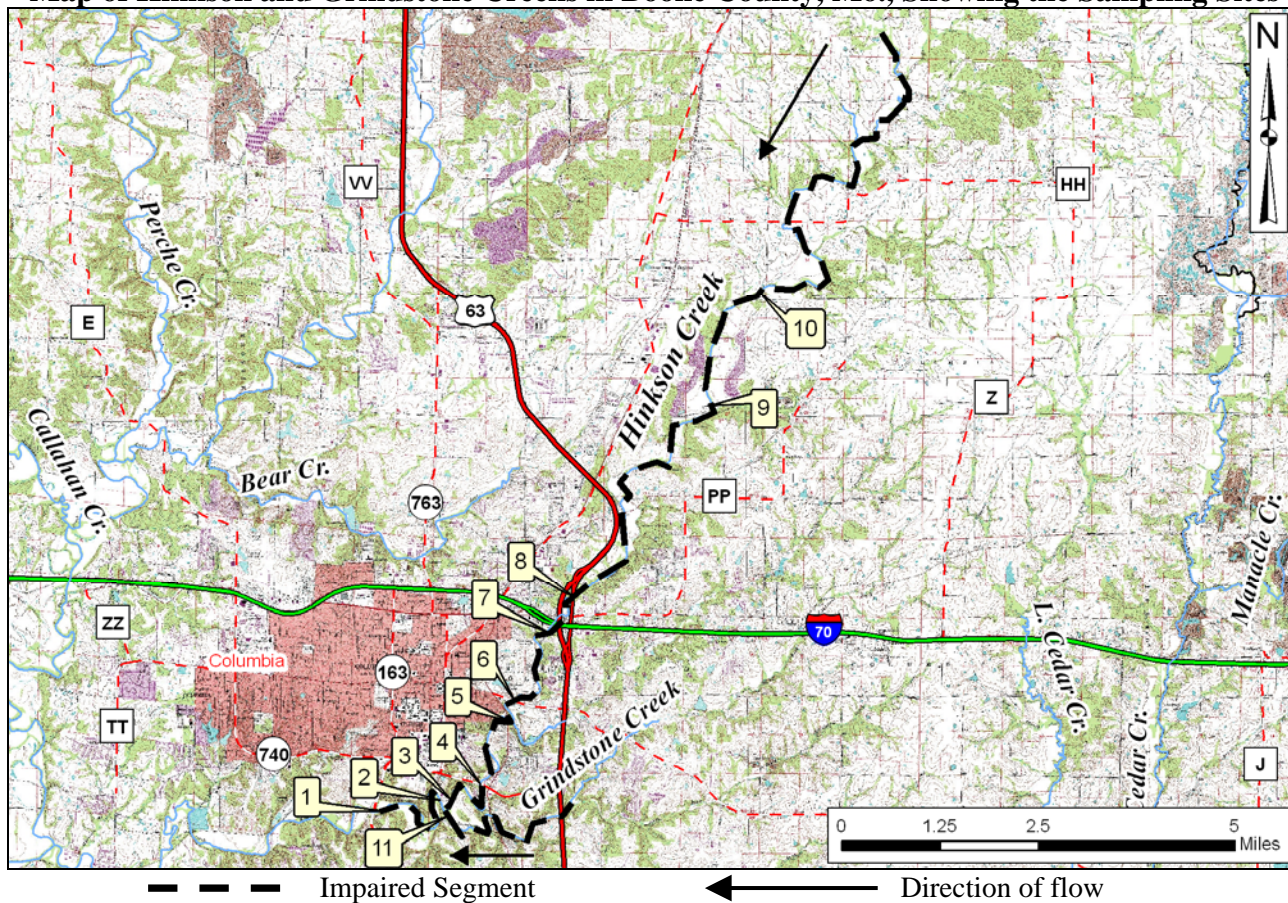
<sup>2</sup> Reid G, Howard J, Gan BS (September 2001). "Can bacterial interference prevent infection?". *Trends Microbiol.* **9** (9): 424–8.



\* The data point for sample # 4 was not graphed, due to the graph's scale. The value for # 4 was measured as 9676 *E. coli* colonies/100mL.



**Map of Hinkson and Grindstone Creeks in Boone County, Mo., Showing the Sampling Sites**



**Sample Sites**

- |                                      |  |
|--------------------------------------|--|
| 1 – Hinkson Cr. @ Providence Rd      | 7 – Hinkson Cr. bl. I-70               |
| 2 – Hinkson Cr. bl. Rock Quarry Road | 8 – Hinkson Cr. just above Hwy 63      |
| 3 – Hinkson Creek ab. Capen Park     | 9 – Hinkson Cr. ab. Hinkson Creek Road |
| 4 – Hinkson Cr. @ Stadium Blvd       | 10 – Hinkson Cr. bl. Rogers Road       |
| 5 – Hinkson Cr. just bl. Hominy Cr.  | 11 – Grindstone Cr. nr. Mouth          |
| 6 – Hinkson Cr. at Broadway Bridge   |  |

**For more information call or write:**

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